

Fostering flexibility and comprehension in elementary students

Teaching students to think more flexibly about words' sounds and meanings can result in increased comprehension.

In the aftermath of the “reading wars” (Pikulski, 1997), we have learned that excellent reading instruction is balanced. Effective reading instruction involves helping students attend to many features of print, including phonics and meaning, so that they become fluent, flexible readers (Pressley, 2006). Beginning readers take a necessary step toward fluent reading when they “unglue” from print sometime between the second and fourth grades and negotiate a crucial transition from decoding-focused reading to more fluent, meaning-focused reading (Chall, 1996; Ehri, 1991). Children must “learn to think of words as having both meaning and sound” (Stahl, Duffy-Hester, & Stahl, 1998, p. 340). This understanding requires that children become more flexible in the way that they think about and approach print. And, even though most primary-grade reading teachers focus on both phonics and meaning, some children negotiate this transition more easily than others.

In fact, inflexibility is often a hallmark of struggling readers. Gaskins and Gaskins (1997), for example, reported that struggling readers who had been referred to the Benchmark School often focused on “sounding out” and “reading words right” (p. 136). These readers often lack the insight that reading is more than decoding, that reading should also be meaningful and make sense. In this article I review work on flexibility in children’s reading processes and share some of my research findings on flexibility in elementary children’s reading. In my work I have found that children can learn to think about print more flexibly and that

improving children’s flexibility leads to improvements in their reading comprehension (Cartwright, 2002). In addition, and more important, this article is intended to provide teachers with a relatively simple strategy to improve flexibility and comprehension for elementary students who may need additional help.

Reading processes and flexibility

Reading involves attention to many features of text, such as word meanings (semantics), phonological information, sentence context, and print itself, or orthography (Adams, 1990), and many theories have been proposed to account for the ways that readers use these features. Kuhn and Stahl (2003) suggested that fluent reading requires flexible attention to all of these features, which support “two interdependent tasks; the reader must determine what words comprise the text while simultaneously constructing meaning” (Kuhn & Stahl, p. 5). This perspective is consistent with Gough and colleagues’ simple view of reading (Gough, Hoover, & Peterson, 1996; Gough & Tunmer, 1986; Hoover & Gough, 1990), a theory that suggests skilled reading is the product of two processes, decoding (determining what words comprise the text) and language comprehension (constructing meaning). In the simple view, if students cannot use the letter-sound information in text to decode words, they will not read well. Likewise, if students have a limited understanding of word meanings in spoken language or cannot construct meaning from words, phrases, and sentences, they will not read well. Both processes are necessary, and neither is sufficient for skilled reading. Students who struggle with learning to read, however, may focus on one or the other of these

tasks, usually decoding, but do not engage in them simultaneously while reading (Gaskins & Gaskins, 1997; Pressley, 2006). In other words, these students demonstrate fairly rigid, inflexible thinking when engaged in reading tasks.

Piaget's classic work on children's cognitive development showed that children do, indeed, shift from rather inflexible thinking to more flexible thinking in the elementary years. Using a variety of assessments, his work showed that early-elementary-age children have a tendency to focus on one idea or aspect of a situation at any given time. In other words, their thinking is fairly rigid. Across the elementary years, however, children become more flexible, gradually acquiring the ability to consider more than one concept at a time (Inhelder & Piaget, 1964; Piaget & Inhelder, 1966/1969). Several studies showed that this kind of flexibility was related to children's reading skill (see, for example, Arlin, 1981; Cohen, Hyman, & Battistini, 1983; Elkind, Larson, & Van Doorninck, 1965), but these studies did not show how, specifically, children's thinking about reading becomes more flexible.

Reading-specific flexibility

Recent work in cognitive development suggests that children's thinking develops in domain-specific ways, in ways that are specific to particular kinds of thinking tasks (Case, 1992). Thus, I adapted Piaget's multiple classification task to the particular demands of reading to assess flexibility in elementary children's reading processes. The multiple classification task required children to sort pictures of objects on two or more dimensions simultaneously (like shape and color) to tap their ability to consider flexibly multiple dimensions when engaging in a task. Children's ability to complete these kinds of multidimensional sorts increased with age, indicating increases in the flexibility with which children could consider attributes of stimuli at the same time (Inhelder & Piaget, 1964).

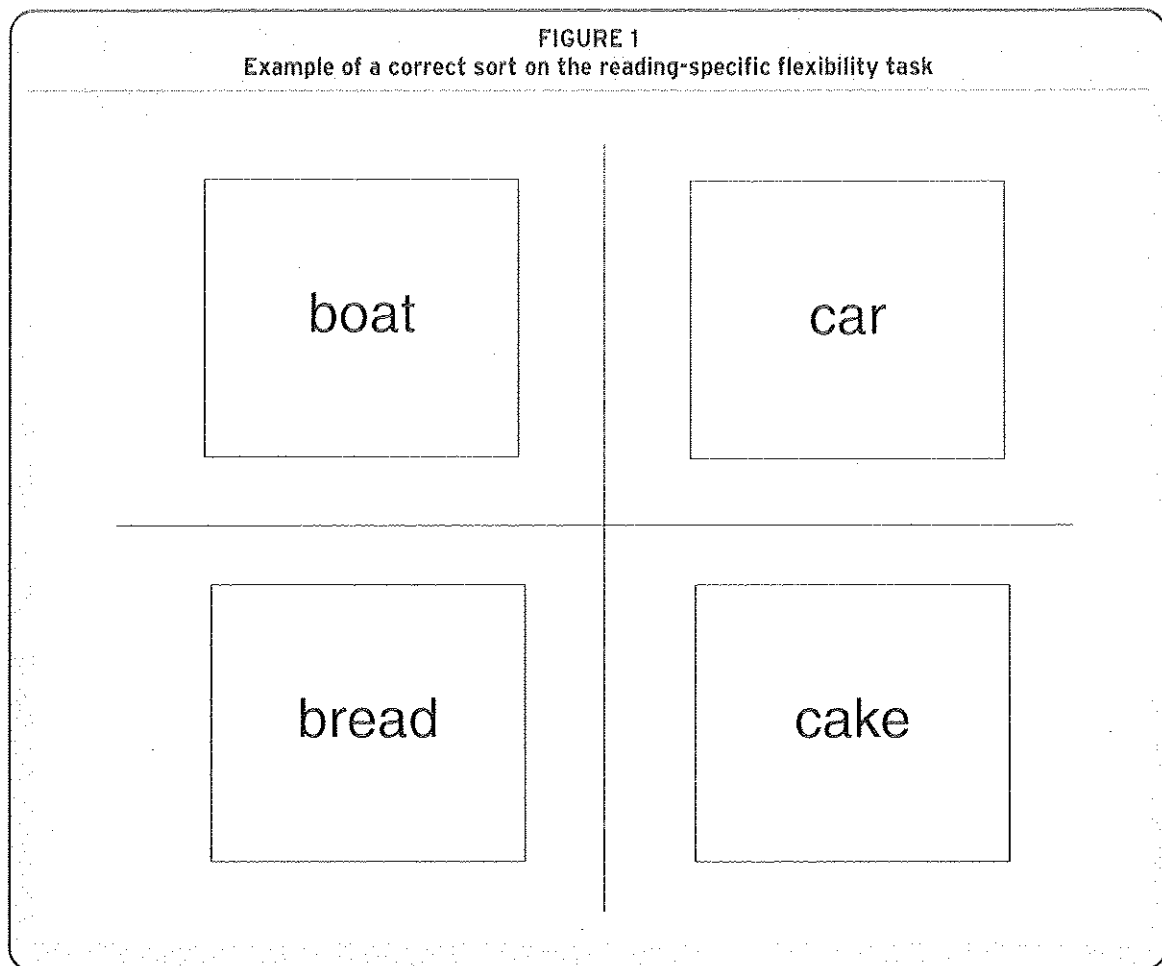
I adapted this task for the particular demands of reading by asking children to sort sets of printed words on phonological and semantic features simultaneously, to determine whether children could attend flexibly to word-level and semantic

features of text. Although children certainly must attend to other kinds of cues to read skillfully, I selected phonological and semantic features because struggling readers tend to focus on decoding (phonological features) without attending to meaning (Gaskins & Gaskins, 1997; Pressley, 2006). For the flexibility task, children were given words such as *boat*, *car*, *bread*, and *cake* and were asked to sort them by "how they sound and what they mean" (that is, by initial phoneme and word meaning) into a 2 x 2 matrix (see Figure 1 for an example of a correct sort). After sorting the words, children were asked to provide a verbal explanation of their sorts because children can produce correct sorts before they have a full, explicit understanding of the multidimensional nature of the sorting tasks (Inhelder & Piaget, 1964). Children could explain the sort correctly by saying something like, "I put the /b/ words and the /k/ words into piles going up and down, and I put the animals and the foods into piles going across."

In my initial study on reading-specific flexibility (Cartwright, 2002), I examined the relation of flexibility to children's reading skill. Forty-four second- to fourth-grade children in regular elementary classrooms at a suburban midwestern U.S. elementary school participated. These children's teachers were interested in the study and agreed to allow them to participate, and the children who returned signed parental permission forms were included in the study. I met with each child individually in the school library, and each one completed all assessments in one session that lasted about an hour. Assessments included a general flexibility task; the reading-specific flexibility task; the Kaufman Brief Intelligence Test (K-BIT; Kaufman & Kaufman, 1990) Verbal subscale to assess language comprehension (semantic processing); the Woodcock Reading Mastery Tests-Revised (WRMT; 1987) Word Attack subtest, Form G, to assess decoding ability; and the WRMT Passage Comprehension subtest, Form G, to assess reading comprehension.

I expected that reading-specific flexibility would make a contribution to children's reading comprehension above that of the contribution of general flexibility, even though general flexibility was related to children's reading skill in prior work. In addition, because the reading-specific flexibility task required children to sort words on

FIGURE 1
Example of a correct sort on the reading-specific flexibility task



phonological and semantic dimensions at the same time, children's phonological (decoding) and semantic processing scores were also used as control variables. Children were shown how to complete the sorting task with one set of 12 word cards, and their reading-specific flexibility was measured, in terms of accuracy and speed of sorting, with four additional sets of 12 word cards (see Table 1 for the word sets used in this initial study). Children's general flexibility was also measured using four sets of 12 picture cards that they sorted by color and type simultaneously (like Piaget's original flexibility tasks that required children to sort on visual features). This study supported the hypothesis and showed that reading-specific flexibility made a unique contribution to children's reading com-

prehension, beyond those of general flexibility, phonological processing, semantic processing, and children's age (Cartwright, 2002, Study 1).

Effects of reading-specific flexibility exercises for elementary students

Because the initial study showed that reading-specific flexibility made a unique contribution to children's reading comprehension, I decided to conduct an experiment to determine whether children could be taught to think more flexibly about the phonological and semantic aspects of text, and whether reading-specific flexibility exercises would produce changes in children's reading-

TABLE 1
Word sets used to pretest and teach reading-specific flexibility in the Cartwright (2002) studies

Card set	Target words sorted by initial phoneme and meaning			
Set 1	cake corn cream	car clip couch	peach peas plum	paint pen plug
Set 2	cheek chest chin	chair chain chalk	hair hand head	harp hook house
Set 3	banana beans bread	belt bonnet boot	salad soup spinach	skirt sock sweater
Set 4	bike boat bus	baboon bear bird	tractor truck train	tiger turkey toad
Set 5	deer dog donkey	dancer dentist doctor	panda pig puppy	pilot pirate president

specific flexibility and reading comprehension. Thirty-six children from Study 1 were randomly selected to participate in the experiment (see Cartwright, 2002, Study 2). These children had already met me, were familiar with the flexibility tasks, and were eager to participate in the experiment. As in Study 1, these children were in second to fourth grade. Thus, they were at the point in reading development at which Chall (1996) argued that children should “unglue from print” and make the shift from decoding-focused reading to more fluent reading.

These 36 children were randomly assigned to three groups that did not differ on age, reading skill, verbal ability, or initial levels of flexibility. One group of 12 children practiced reading-specific flexibility exercises with me for five days, a second group of 12 children practiced general flexibility exercises with me for five days because prior work had shown that practice on general flexibility tasks produced improvements in reading skill (see Cohen et al., 1983), and a third (control) group of 12 children played dominoes with me for five days to ensure that daily individual attention did not produce improvements in children’s performance. Thus, all three groups experienced five days of individualized attention from

me in sessions that lasted approximately 15 minutes each. After completing the flexibility exercises, children were tested on reading comprehension using the WRMT Passage Comprehension subtest, Form H (which included different items from the pretest measure in Study 1) and reading-specific flexibility (using new word sets). Results showed that children who had practiced reading-specific flexibility exercises showed significant increases in reading-specific flexibility and reading comprehension (with an average increase of 4.42 items correct on the WRMT Passage Comprehension subtest), while children in the other groups showed no improvements on these measures, as predicted (Cartwright, 2002). Thus, children who practiced the reading-specific flexibility exercises were able to think more flexibly about semantic and phonological aspects of print, and these children’s reading comprehension improved.

In the following section I provide details on the reading-specific flexibility exercises that I used in the experiment. These exercises are relatively simple to implement and can be performed by volunteers or teachers’ aides with individual students who may need assistance in achieving flexibility in reading processes.

How to complete reading-specific flexibility exercises with elementary students

The procedure for the reading-specific flexibility exercises was adapted from prior work (Bigler & Liben, 1992; Inhelder & Piaget, 1964). I completed these 15-minute exercises with individual students on five consecutive school days, and I met with each child at locations away from regular classroom activities, such as in the school library, in a resource room, or even at a desk in the hall (when space was limited). Exercises on each of the five days were conducted with a different set of cards (see Table 1) and occurred in two phases: reclassification and matrix completion.

Phase 1: Reclassification

The purpose of this phase was to familiarize the student with the words on the cards and to ensure that the student was able to attend to phonological and semantic dimensions independently, within the same word set. At the beginning of each day's session the student was first asked to sort the stack of word cards into two piles along one dimension (that is, phonologically or semantically—the order varied across days). For example, the student might sort the first word set phonologically into two piles, one that included six words beginning with the /p/ sound and one that included six words beginning with the /k/ sound (see Table 1). Next, I reshuffled the set of 12 cards and asked the student to sort the cards along the other dimension into two new piles. Thus, the student would re-sort the card set into two new piles, one that included six foods and one that included six nonfoods (see Table 1). To summarize, the reclassification phase of the flexibility exercises required the student to perform two successive one-dimensional sorts of the word cards. If a student placed a card incorrectly, I placed the card on the correct pile and provided an explanation for the correction. Students rarely had any difficulty sorting and then re-sorting the cards in this phase of the daily exercises.

Phase 2: Matrix completion

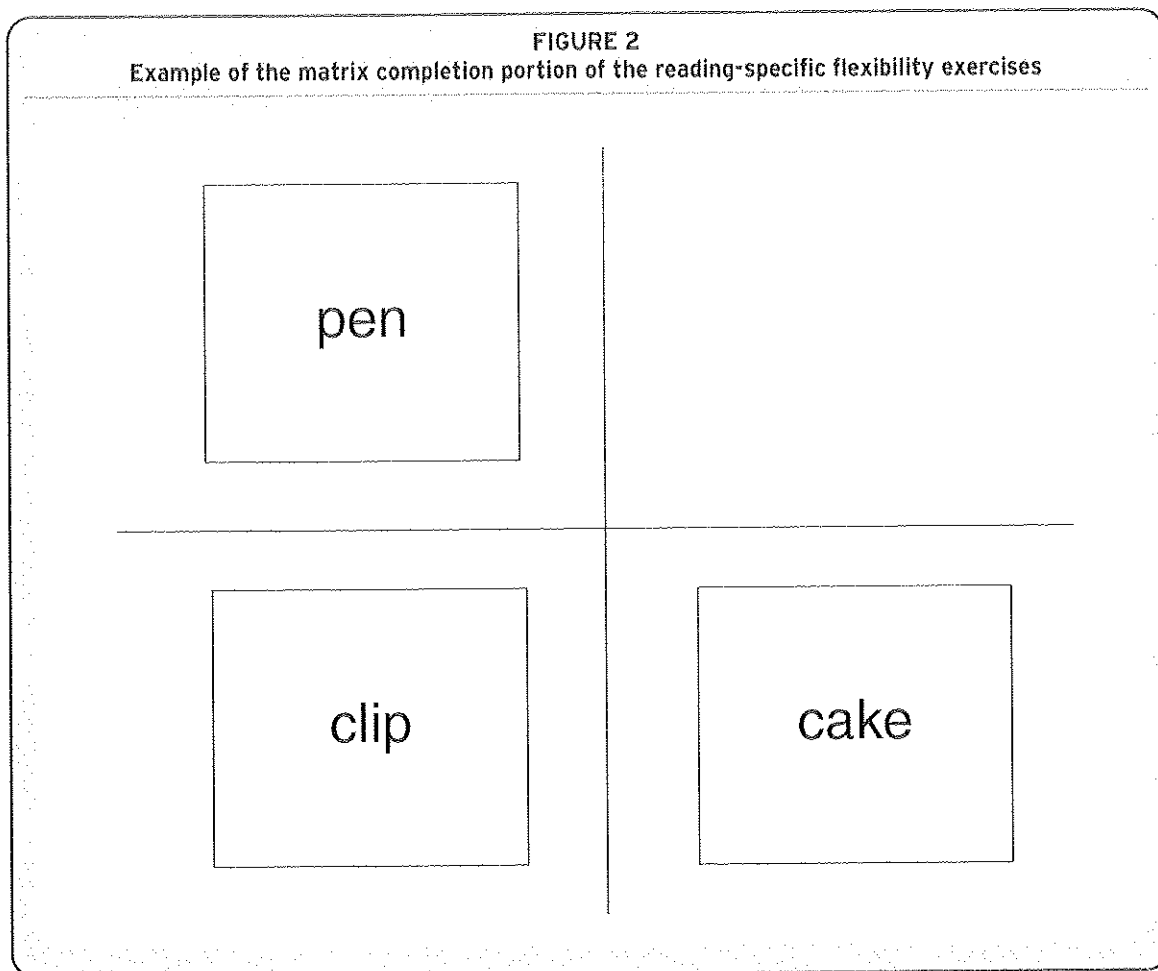
After the student classified the day's word set on each dimension successively, I reshuffled the

cards and removed them from the table. To create a visual support for completing a two-dimensional sort of the word cards, I placed two flat, wooden sticks in front of the child to form a 2×2 matrix and told the child that we were going to play a new game with the cards. Next, I placed three cards in the 2×2 matrix so that they were sorted semantically along one axis of the matrix and phonologically on the other axis of the matrix (see Figure 2). Then, I gave the student the remaining nine cards in the set and asked him or her to "find a word that goes here" (while pointing to the empty space in the matrix). For example, if I placed the words *cake*, *clip*, and *pen* in the matrix as shown in Figure 2, a student could respond correctly by selecting *peach*, *peas*, or *plum* to complete the 2×2 matrix. Students who responded incorrectly often selected words that preserved one dimension of the sort (usually phonological) and did not show awareness of the second dimension (usually semantic). If the student selected an inappropriate word, I demonstrated a correct choice and provided a verbal explanation for the choice (e.g., "I chose this word so that the /k/ words and the /p/ words are sorted into different piles going up and down and the foods and nonfoods are sorted into different piles going across"). At this point students would often experience the insight that the individual words could be sorted two ways, saying things like, "Oh, it has to be a food, too! I just sorted by how it sounded." The matrix completion portion of the exercises continued with the same word set until the student provided four consecutive correct responses. I simply reshuffled the cards after each matrix completion attempt and placed a new combination of three cards into the matrix for the next matrix completion attempt. Once the criterion of four consecutive correct responses was reached, the day's session was completed, and the student returned to class.

Improved flexibility for improved comprehension

We know that excellent reading instruction is balanced, with attention to many features of text (Pressley, 2006). We also know that skilled readers attend to many of these features at the same time, including word-level phonological information

FIGURE 2
Example of the matrix completion portion of the reading-specific flexibility exercises



and meaningful, contextual information (Adams, 1990; Gough et al., 1996; Gough & Tunmer, 1986; Hoover & Gough, 1990; Kuhn & Stahl, 2003; Pressley). Chall (1996) suggested that as children develop as readers, they distance themselves from the phonological features of print and begin to focus on meaning. However, some children have difficulty thinking flexibly about reading tasks and achieving the shift to more fluent reading, often focusing solely on word-level information (Gaskins & Gaskins, 1997; Pressley). In this article, I presented a simple strategy that can be used to help children think more flexibly about print and improve comprehension. This strategy is relatively simple to implement and can be taught to volunteers or teachers' aides who can work with indi-

vidual children who may need additional help in achieving flexibility in reading.

The reading-specific flexibility exercises presented in this article are relatively new and look promising based on the research done to date (Cartwright, 2002), but additional studies are needed to verify the exercises' effectiveness. For this reason, teachers should carefully monitor the impact of these exercises on students' flexibility and comprehension and consider the flexibility exercises as one tool (among many) to be used as they engage in professional decision making to meet individual students' needs. Some children do struggle with thinking about words as having both sounds and meaning (Gaskins & Gaskins, 1997; Pressley, 2006; Stahl et al., 1998). The simple

exercises presented in this article may provide one avenue for helping students achieve increased flexibility in reading processes and aid them in making the transition to more fluent reading and better reading comprehension.

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